I have also excluded introduced species, such as trout, and fishes which only occasionally enter fresh water from the sea.

1. **Vlaminghian Fluvifaunula.**
   Wide-mouthed Lamprey, *Geotria australis* Gray, 1851.
   Narrow-mouth Lamprey, *Yarra singularis* Castelnau, 1872.
   Native Minnow, *Galaxias occidentalis* Ogilby, 1899.
   Mountain Trout, *Galaxias truttaceus hesperius* Whitley, 1944.
   Freshwater Cobbler, *Tandanus bostocki* Whitley, 1944.
   Hardyhead, *Craterocephalus edelensis* (Castelnau, 1873).
   King River Perchlet, *Nannatherina balstoni* Regan, 1906.
   Nightfish, *Bostockia porosa* Castelnau, 1873.
   Pigmy Perch, *Edelia vittata* Castelnau, 1873.
   Goby, *Glossogobius suppositus* (Sauvage, 1880).
   (Also characteristic are the freshwater tortoise, *Chelodina oblonga;* the mussel, *Westralunio;* a freshwater sponge, *Ephydatia multiformis;* and the crustacea, *Palaemonetes australis, Daphnia thomsoni,* and *Chaeraps* spp. The Mountain Trout, *G. t. hesperius,* and a frog, *Hyla cyclorhyncha* of the Albany-Esperance region are allied to Tasmanian forms.)

2. **Sturtian Fluvifaunula.**
   Hardyhead, *Craterocephalus cuneiceps* Whitley, 1944.
   (*Coxiella* and other mollusca are characteristic of this desert fluvifaunula.)

3. **Greyian Fluvifaunula.**
   Spangled Perch, *Madigania unicolor* (Gunther, 1859).*
   Gudgeon, *Carassiops compressus* (Krefft, 1864).
   Blind Gudgeon, *Milyeringa veritas* Whitley, 1945.
   (also characteristic: Northern tortoise, *Chelodina steindachneri,* and the mussel, *Lortiella.)*

4. **Leichhardtian Fluvifaunula.**
   Sawfish, *Pristis clavata* Garman, 1906 (? purely freshwater).
   Leichhardt's Sawfish, *Pristiopsis leichhardti* Whitley, 1945.
   Bony Bream, *Fluvialosa* sp. A.
   Bony Bream, *Fluvialosa,* sp. B.
   Catfish, *Neosilurus brevidorsalis* Gunther, 1867, or allied species.
   Eel, *Anguilla bicolor* McClelland, 1844.
   Spangled Perch, *Madigania unicolor* (Gunther, 1859).
   Grunter, *Mesopristes jenkinsi* Whitley, 1945.
   Chanda Perch, *Aeanthoperca gulliveri* Castelnau, 1878.
   Archer Fish, *Toxotes chatarens* (Ham-Buch., 1822).
   Gudgeon, *Carassiops compressus* (Krefft, 1864)—ex Bruce Shipway, Mss.
   Goby, *Glossogobius giuris* (Ham-Buch., 1822).

ANIMAL LIFE IN MANGROVES

By F. LAWSON WHITLOCK, Bunbury

Mangroves are tropical trees of which numerous genera and species are known. The most common in Western Australia is the white mangrove *(Avicennia marina)* which extends on the mainland as far south as Shark Bay, where I have found a few growing on the eastern shore of Dirk Hartog Island and on Peron Peninsula. However there is a curious outlier in a restricted

*The wide range of this fish, commonly referred to in the literature as *Therapon unicolor,* almost coincides with that of the frog, *Hyla rubella.*

locality in the Lesehenault Estuary, Bunbury. The red mangrove *(Ceriops Tagal)* extends south to about Onslow. Both the white and red mangroves are characteristic of sandy and sandy- mud soils of the creeks of the north-west coast and the muggy atmosphere encourages mosquitoes, midges and other insect life of an aggressive nature. Though mangroves are also found facing the open ocean (particularly the red mangrove) the life they harbour there is not so plentiful as in the thickets lining the margins of big salt-water creeks, such as occur near Derby, Condon, Cossack and Port Hedland, and it is in these four localities in which I have done a little investigation on mangrove faunas. The black mangroves *(Rhizophora mucronata* and *Bruguiera conjugata)* are purely estuarine, occurring in mud and forming dense jungles in the north-west of the Kimberley Division. I have had no experience of these mangroves.

To explore mangroves it is necessary to protect the feet owing to the sharp pieces of debris being mixed with the surface mud. If indiarubber shoes are used they must be securely fastened on the feet to prevent them being sucked off by the glutinous mud. In places where the half liquid mud is mixed with sand the difficulty of penetrating the thickets is much lessened; such was the case at Condon, where I had my first experiences in October, 1908.

When I did my research work I was chiefly concerned with ornithology, but my interest was naturally drawn by other living forms. On arriving at a promising looking thicket, at Condon, my attention was soon attracted by a torrent of musical notes from within. I cautiously entered and imitating some of the notes as well as I could I presently lured the songster into view. It was a fine male of the White-breasted Whistler *(Pachycephala lanioides)*. I knew the nest and eggs of this species of whistler were unknown and I at once decided to devote some time to clearing up the mystery surrounding its nidification. It was not long before I spied the female, which is a much duller bird. She was visibly uneasy, which was encouraging. I watched her actions for some time and she eventually slipped away. On further exploring this thicket I located several other pairs. To make a long story short I was ultimately successful in locating several nests and obtained eggs which are now in the H. L. White Collection of the National Museum, Melbourne.

Other species of birds were present. The Yellow Silver-eye *(Zosterops lutea)* was fairly plentiful, and a larger bird was calling in taller mangroves facing the open ocean. The notes were very loud and reminded me of those of the peacock. I spied the caller: it was a fine individual of the beautiful Red-backed Sea-eagle *(Haliastur indus)*. It was perched on the topmost limb of the tallest tree in the group. Near its perch I made out a large nest. On climbing I found it contained a single well-grown young bird. It looked as if it had been in a snow storm, for the otherwise dull brown of the plumage was freely spotted with white. This

effect was produced by the underlying white down not being fully covered by the general dull brown plumage. Some years later when visiting Barrow Island in the Dampier Archipelago I encountered two more pairs of this eagle. I was actually snugly encamped on a small sand-bank surrounded by mangrove. I had chosen this site after my tent erected on nearby higher ground had been blown down. I found conditions very favourable so long as a high tide should not supervene, and it proved an ideal situation for observing life in the mangroves. I soon spotted a pair of these small eagles, which appeared to be attached to a small patch of trees on a neighbouring islet. I crossed over at low tide and the female rose from a tall tree, in which was a large and deep nest to which I climbed. It contained two eggs, of a dull pale green and of rather a coarse texture. At another patch of mangroves some two miles away I found a third nest in rather a low tree. This nest was empty but whilst I had a few minutes rest the female actually came and perched on the rim of the nest without observing me. On catching sight of me eventually she did not evince any alarm and we continued to look at one another for some little time. She was perched not ten feet above my head. The beautiful cinnamon colour of her mantle showed to the best effect.

At Port Hedland I had opportunities of watching these eagles procuring their food. What it consisted of I was not near enough to see. The birds cruised around at a height of thirty or forty feet, and on spying their prey swooped down and nimbly grabbed it from the surface of the water. Rising again the head was gracefully lowered till it met the foot and the food was eaten whilst the bird was on the wing.

Surrounding my camp at Barrow Island was a profusion of grey-leaved shrubs. They were loaded with pink berries, which though small had a pleasant acid taste. One of the most numerous birds feeding on them was the Singing Honeyeater *(Meliphaga virescens)*. The little Brown Honeyeater *(Gliciphila indistincta* was there too, and numbers of *Zosterops lutea,* the same species I found at Condon. At night I was awakened by small mammals running about, and a pair of incubated eggs of the Pied Oystercatcher *(Haematopus ostralegus)* that I was attempting to blow, were broken and their contents eaten. There were several other familiar birds flitting about, such as the so-called Willie Wagtail *(Rhipidura leucophrys)* and the Australian Pipit *(Anthus australis)*.

But Barrow Island cannot compare with the other mentioned localities for mangroves. I had an interesting experience at Condon. I noticed a struggle going on and on investigating the cause found a sea-snake about three feet long endeavouring to engulf a small crustacean which was doing its best to escape. I did not, however, see the outcome for the tide came swirling in and I had hurriedly to grab my gun and get on to solid ground. The mangroves at Condon lining the smaller creeks were less dense and when the flood tide came in the first stream was usually

pushing ahead of it a number of small fish. They looked like mud-skippers *(Euchoristopus kalolo)* though I never caught one. In these mangroves a conspicuous bird was the White-breasted Wood-swallow *(Artamus leucorhynchus)*. They were nesting, and one or other of the pair was usually perched on the highest twig near the nest. Several of the nests contained eggs.

I have paid casual visits to Port Hedland where I again met a pair or two of the White-breasted Whistlers. I was much interested when I observed these birds feeding on the numerous small molluscs. Their method was to carry the molluscs and beat them against a convenient tree. When broken the inmate was quickly devoured. There was a second species of *Pachycephala* there. It was smaller, and the male resembled the handsome Golden Whistler *(P. pectoralis)* of the south, the female of which is a sombre-coloured bird. This was the Black-tailed Whistler *(P. melanura)*, but the female differs much from the South-west female. Her plumage may be fittingly described as a subdued edition of that of her mate. At low tide I had fine views of White Egrets stalking about the mud flats, as well as parties of waders, one of which I secured by ambushing them. It proved to be the rare Terek Sandpiper *(Xenus cinerea)*.

A species of crab was very numerous just on the verge of the trees. My attention was attracted by hearing sharp noises, "crick, crick, crack!" I soon located them as these crabs are coloured bright red. They sit at the mouths of their burrows waving their one large red claw. I found them very wary: they disappeared in a flash. There was another and larger crab I got a brief glimpse of. It had two powerful pinching claws and was equally wary.

At Peron Peninsula, Shark Bay, I found a few isolated mangroves big enough for crows to nest in and in one instance I found a pair of Kestrels feeding a brood of young in an old crow's nest. Walking on the nearby sand one day I observed what I thought was a small flock of stints or small plover. They were moving very quickly in a compact party. I had to walk quite a hundred yards before I overtook them. The "waders" proved to be a party of small crabs, coloured a pale brown. The speed they got over the ground fairly astonished me.

An interesting bird nesting in the Condon mangroves was the Mangrove-bittern *(Butorides striata)*. This is rather a small species and related to the herons. I found several nests. They were very poor affairs, just platforms of sticks which, one would think, would be hardly capable of supporting the mother bird and three young. Two nests contained eggs of a very pale green colour and coarse texture.

The Mangrove Kingfisher *(Halcyon chloris)* seems rather a rare species. I have only met with one pair, and that was on Barrow Island. It is larger than the familiar Sacred Kingfisher *(H. sanctus)* being quite two inches longer from tip of beak to tip of tail. Its plumage appeared to me to be duller in colour.